



The Grand Challenges of Integrated Research on Disaster Risk

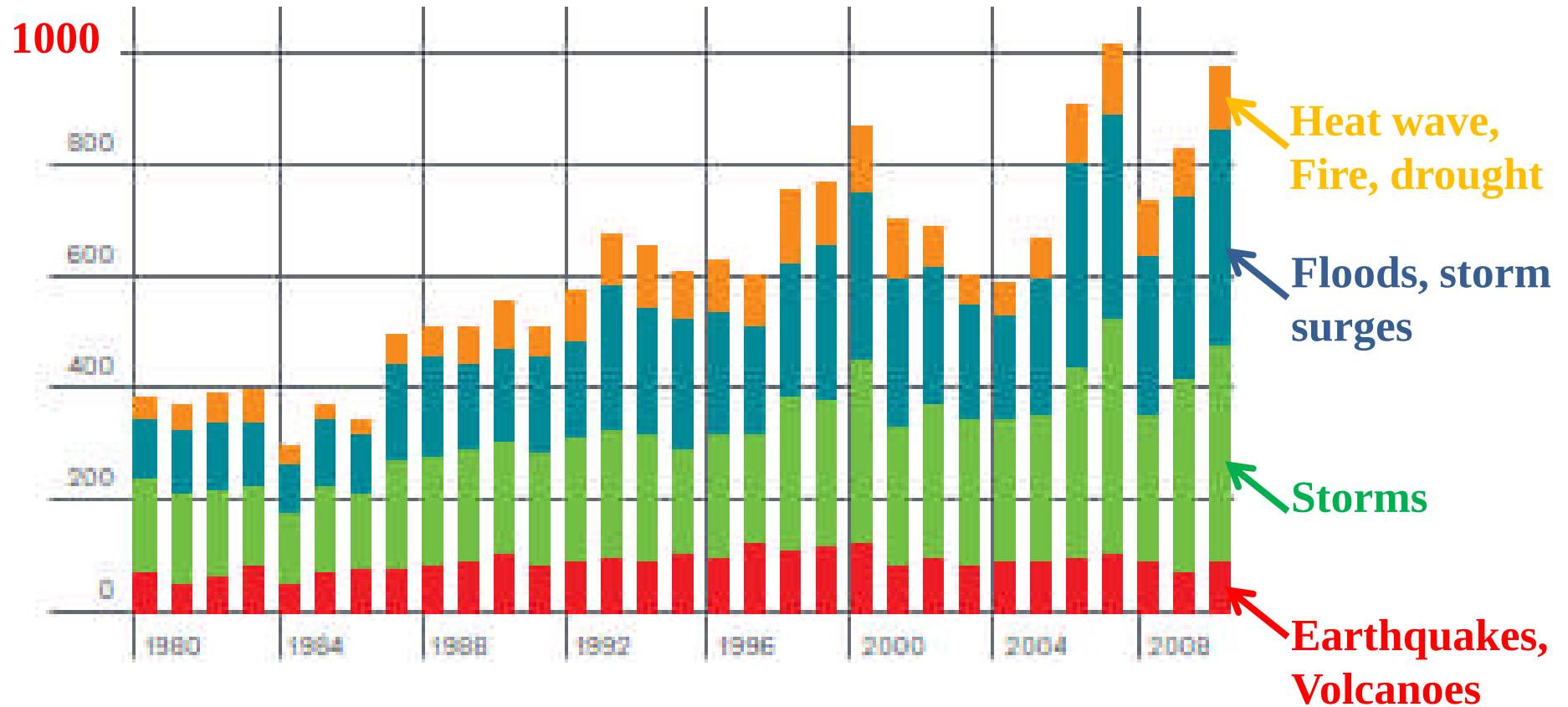
**Presentation to IUGG General Assembly
Melbourne, June 2011**



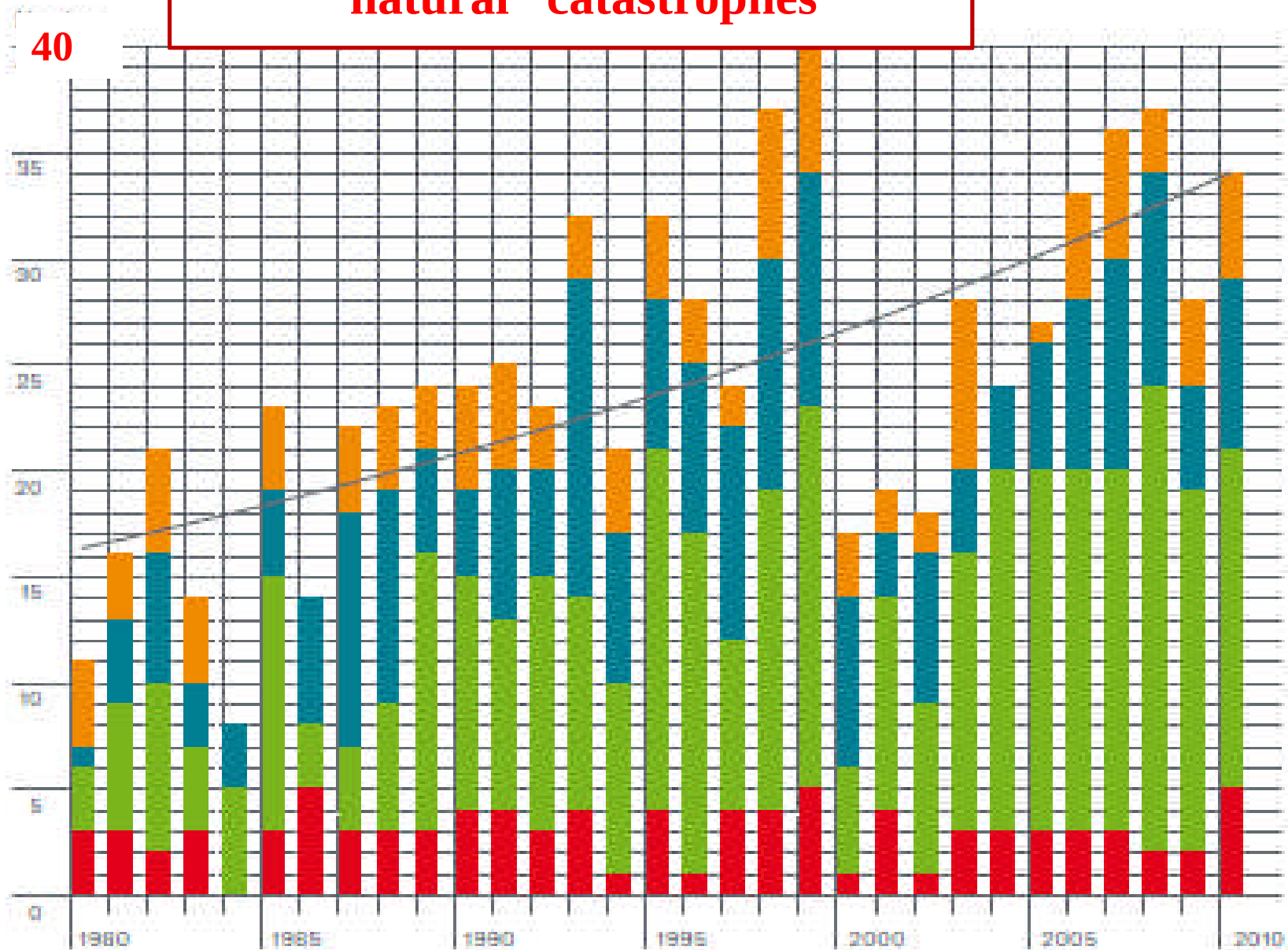
**Professor Gordon McBean
Institute for Catastrophic Loss Reduction
The University of Western Ontario, Canada
Chair, Science Committee
Integrated Research on Disaster Risk
President – START International**

Number of “natural” catastrophes

Number of natural catastrophes 1980-2010



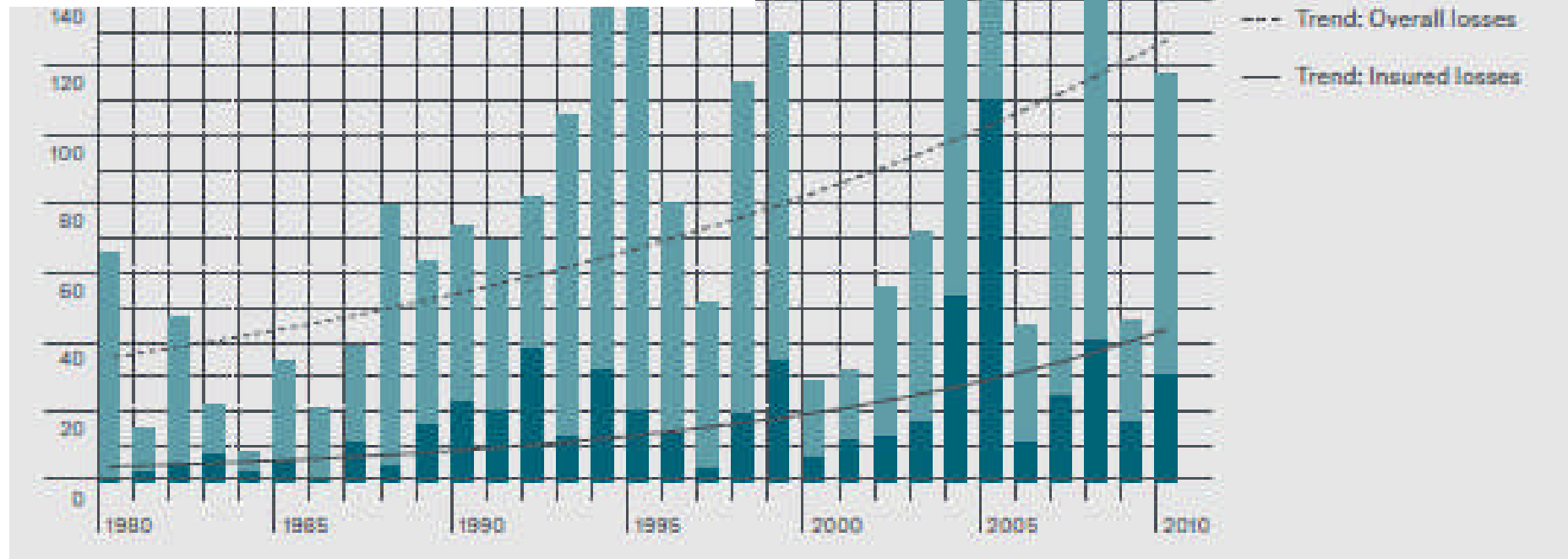
Number of great and devastating “natural” catastrophes



Overall losses and insured losses - Absolute values and long-term trends

\$240B US

The number of disasters and their economic costs continues to rise.



HAZARD: *potentially damaging physical event, environmental condition, or human activity that **MAY** cause the loss of life or property or damage to property*

The Grand Challenge:
How can science (all sciences)
help reduce
the number and impacts
of disasters?

“serious disruption of the functioning of a community or a society involving widespread human, material, economic or environmental losses and impacts, which exceeds the ability of the affected community or society to cope using its own resources.”

Disasters result
when there is the
intersection of a
hazard and exposed
vulnerability

Research -

- **Hazards**
- **Exposure**
- **Vulnerability**
- **Response**
- **Coping**
- **Intersections**

International Context

World Commission on Environment and Development

- sustainable development in the statement:
“Humanity has the ability to make development sustainable - to ensure that it meets the needs of the present without compromising the ability of future generations to meet their own needs”.
 - future generations – “seeing the future”
- integrated, multi-disciplinary, science-based predictions of the future are essential.
- Disasters exert a powerful influence over economic and social development and can diminish and even reverse the economic development of states.

World Summit on Sustainable Development - Millennium Development Goals

IV. Protecting and managing the natural resource base of economic and social development

- ***37. An integrated, multi-hazard, inclusive approach to address vulnerability, risk assessment and disaster management, including prevention, mitigation, preparedness, response and recovery, is an essential element of a safer world in the twenty-first century. Actions are required at all levels to:***

World Conference on Disaster Reduction, Kobe, January 2005 Hyogo Framework for Action (HFA) Priorities for Action

- 1. Ensure that disaster risk reduction is a national and a local priority with a strong institutional basis for implementation.**
- 2. Identify, assess and monitor disaster risks and enhance early warning.**
- 3. Use knowledge, innovation and education to build a culture of safety and resilience at all levels.**
- 4. Reduce the underlying risk factors.**
- 5. Strengthen disaster preparedness for effective response at all levels.**



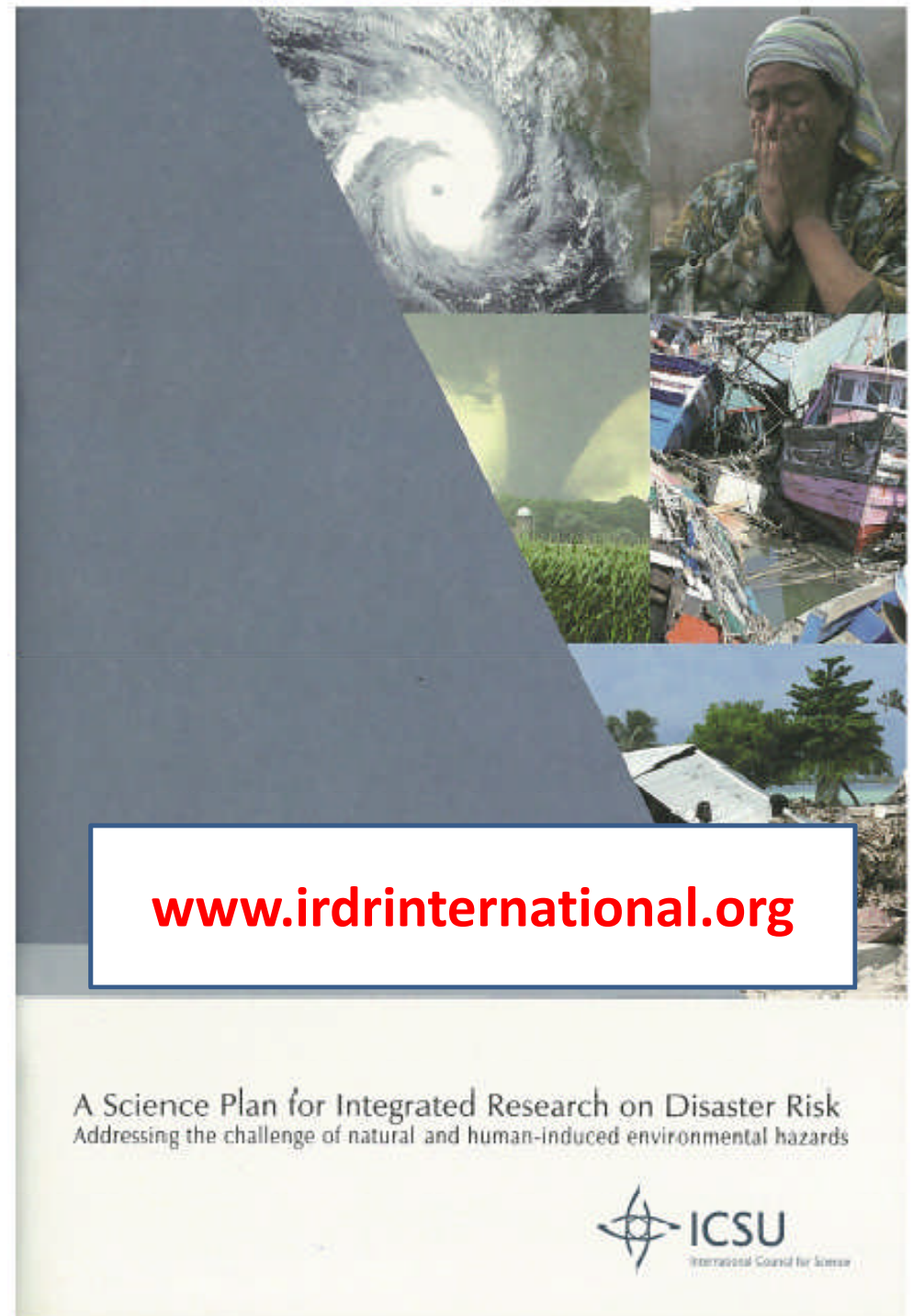
ICSU Priority Area Assessment on Capacity Building in Science (2005): Executive Summary

- Great challenge is ‘a development problem...the **widening gap between advancing science and technology and society’s ability to capture and use them.**’
- The increases in costs of disasters are taking place in both developed and developing countries, which suggest that reducing the risks from hazards is **not simply a matter of economic growth and development.**
- There is a great shortfall in current research on **how science is used to shape social and political decision-making** in the context of hazards and disasters.

- **The Scoping Group:** *Why, despite advances in the natural and social science of hazards and disasters, do losses continue to increase?*
- **Planning Group Assessment:** Despite all the existing or already planned activities on natural hazards, an integrated research programme on disaster risk reduction, sustained for a **decade or more and integrated across the hazards, disciplines and geographical regions**, is an imperative. The value-added nature of such a programme would rest with the **close coupling of the natural, socio-economic, health and engineering sciences.**

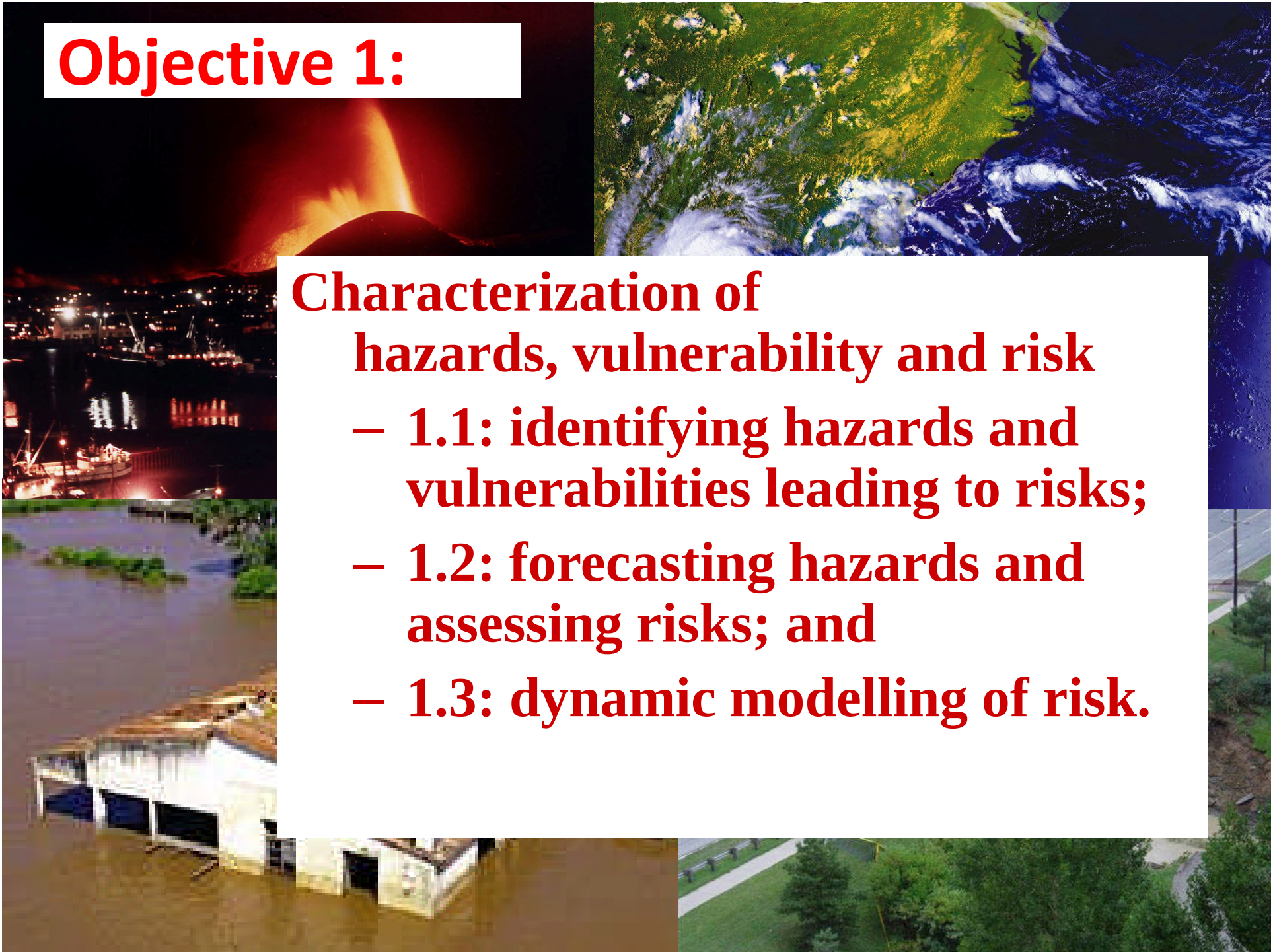
Integrated Research on Disaster Risk

**Addressing the challenge of
natural and human-induced
environmental hazards (IRDR)
An integrated approach to
research on disaster risk
through: an
international, multidisciplinary
(natural, health, engineering
and social sciences, including
socio-economic analysis)
collaborative research
programme. - Sept/2008**



Objective 1:

- Characterization of hazards, vulnerability and risk**
- 1.1: identifying hazards and vulnerabilities leading to risks;
 - 1.2: forecasting hazards and assessing risks; and
 - 1.3: dynamic modelling of risk.



Objective 2:

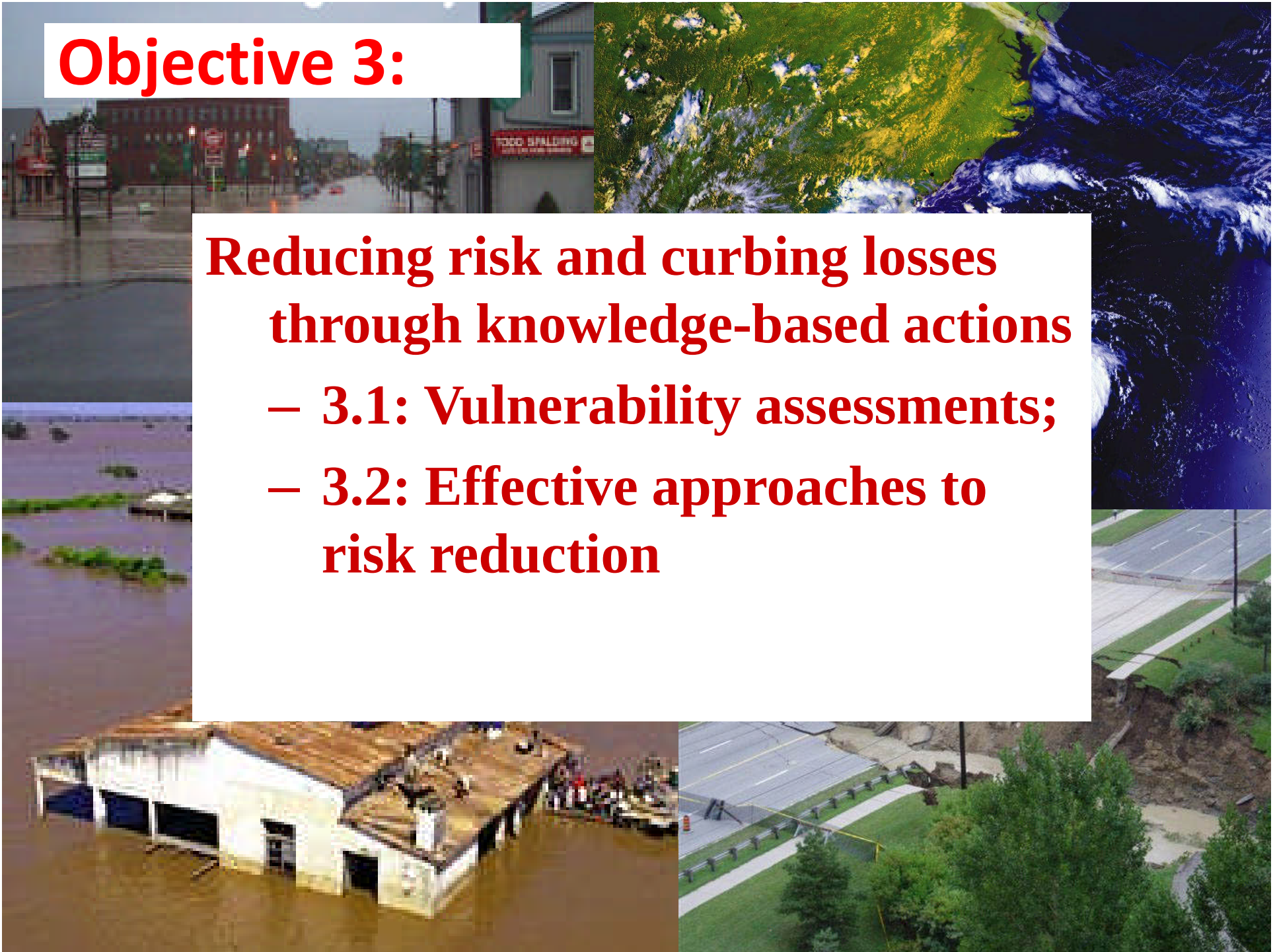
Effective decision making in complex and changing risk contexts

- **2.1: Identifying relevant decision-making systems and their interactions**
- **2.2: Understanding decision making in the context of environmental hazards; and**
- **2.3: Improving the quality of decision-making practice.**

Objective 3:

**Reducing risk and curbing losses
through knowledge-based actions**

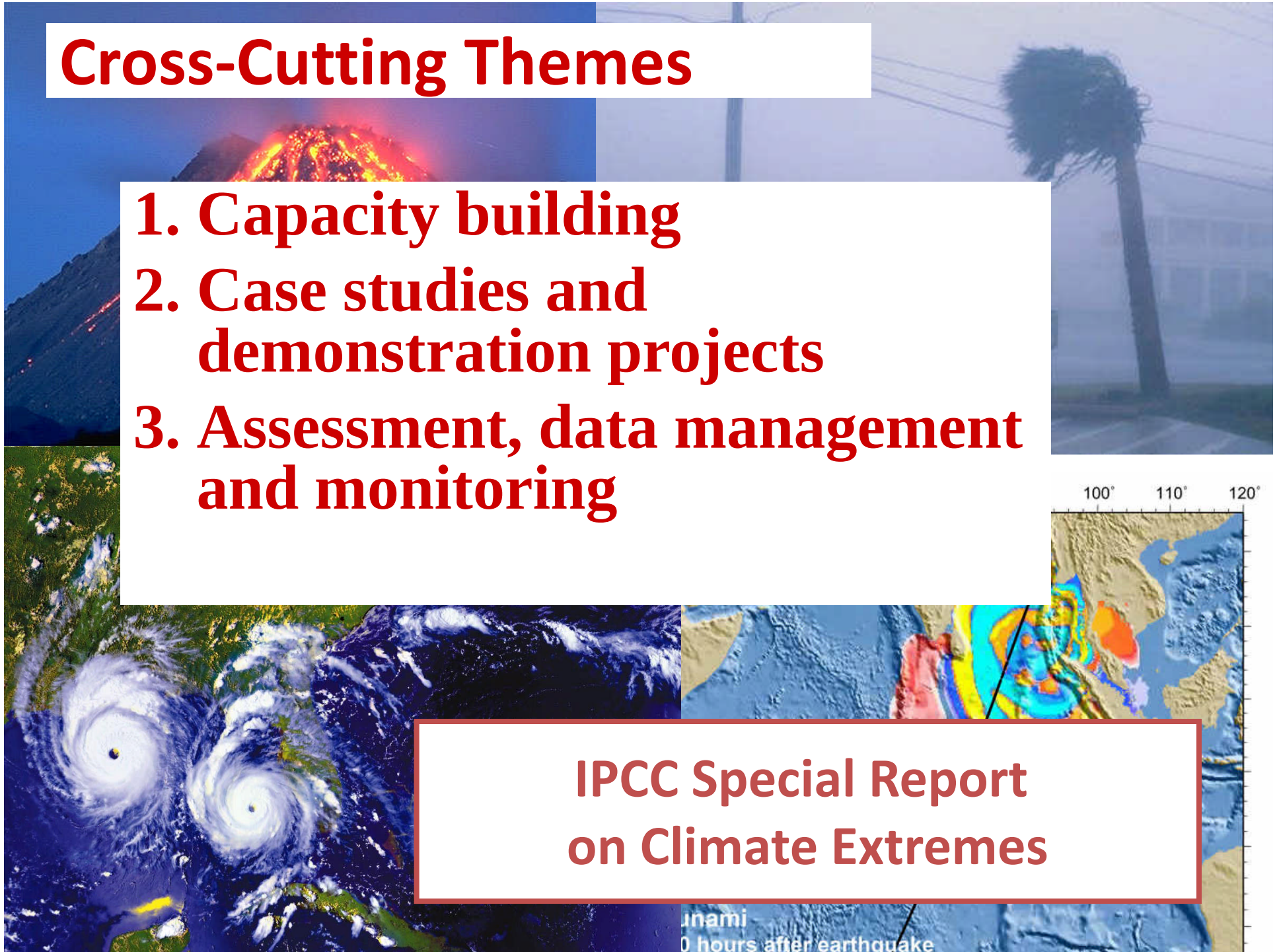
- 3.1: Vulnerability assessments;**
- 3.2: Effective approaches to
risk reduction**



Cross-Cutting Themes

1. Capacity building
2. Case studies and demonstration projects
3. Assessment, data management and monitoring

IPCC Special Report
on Climate Extremes



**IRDR – International
Program Office - Beijing**
www.irdrinternational.org

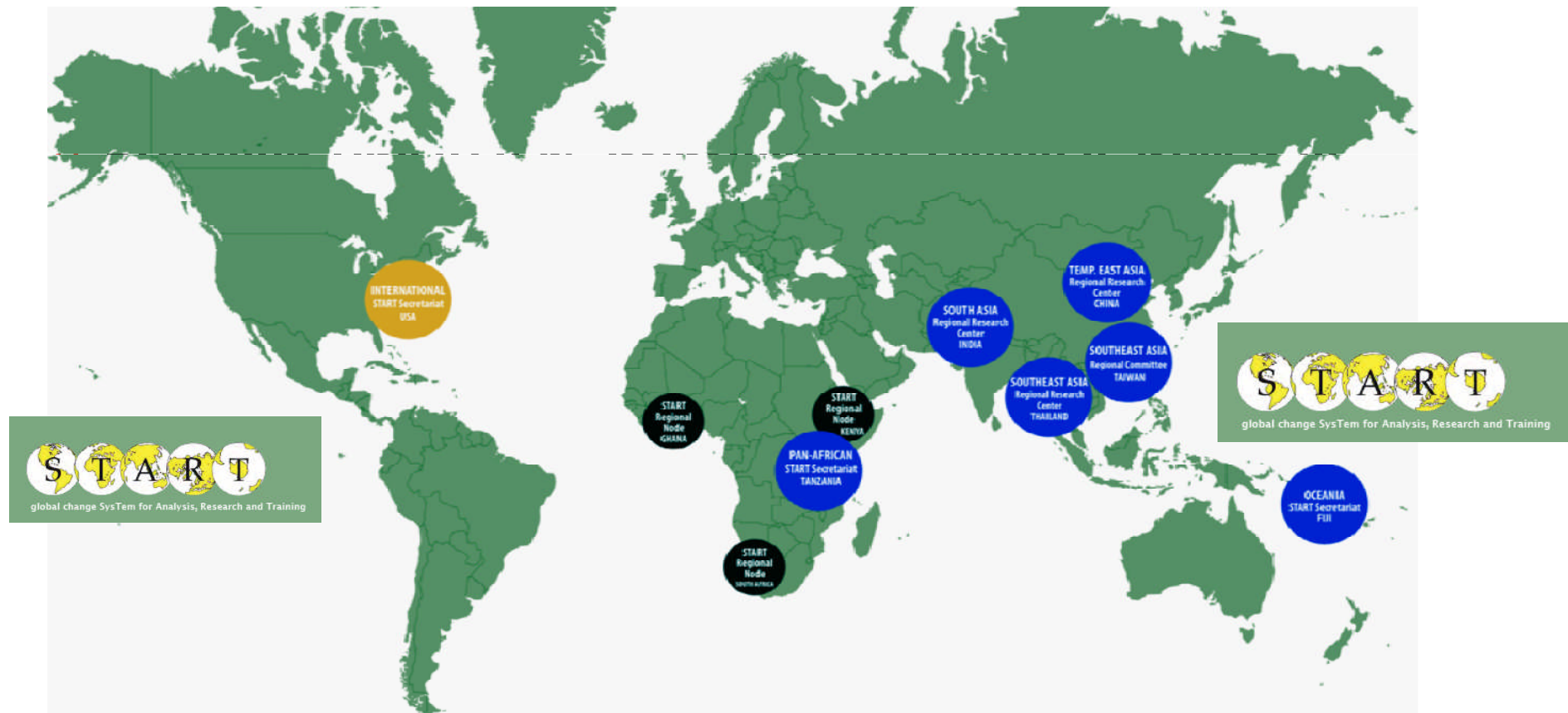


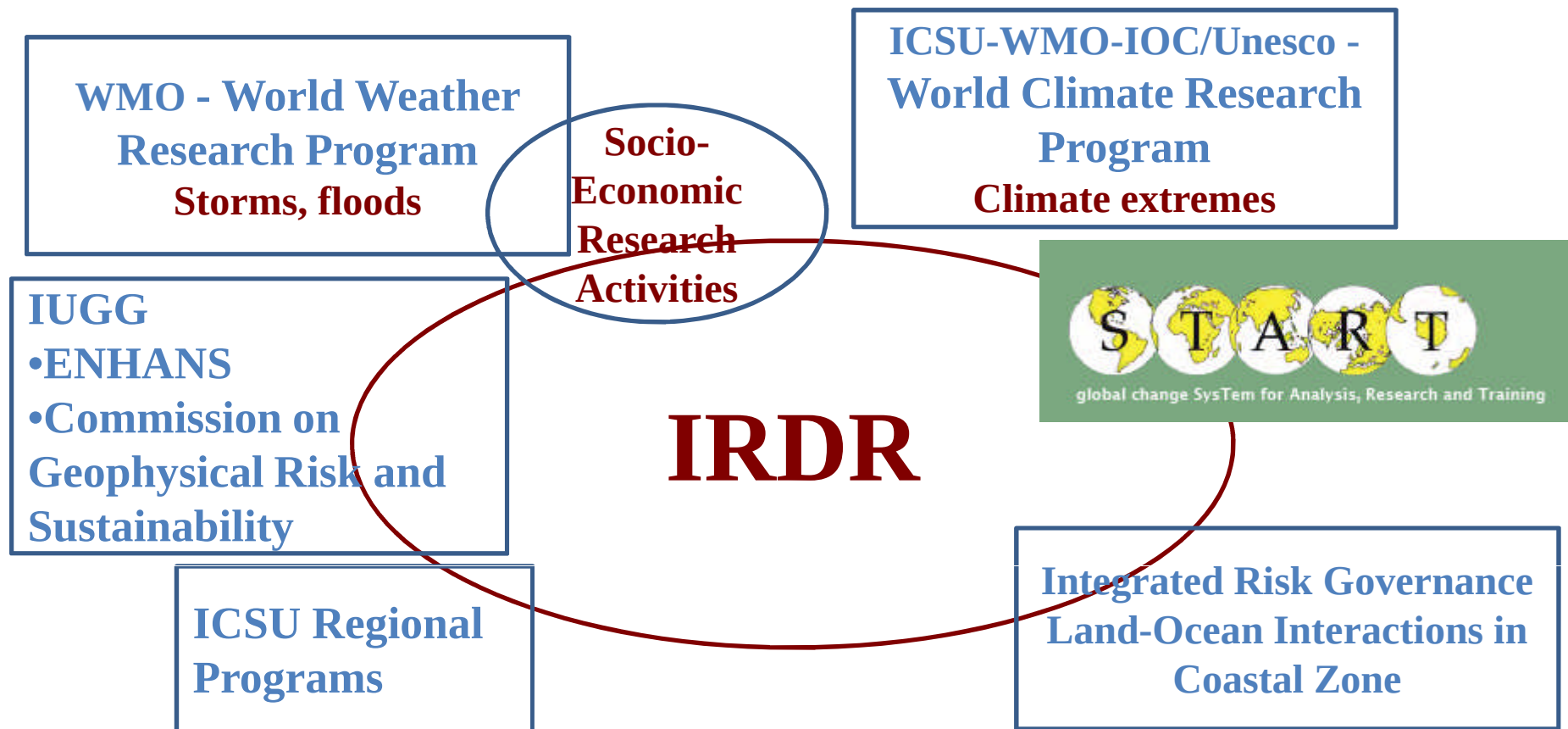
**IRDR – International
Center of Excellence- Taipei**

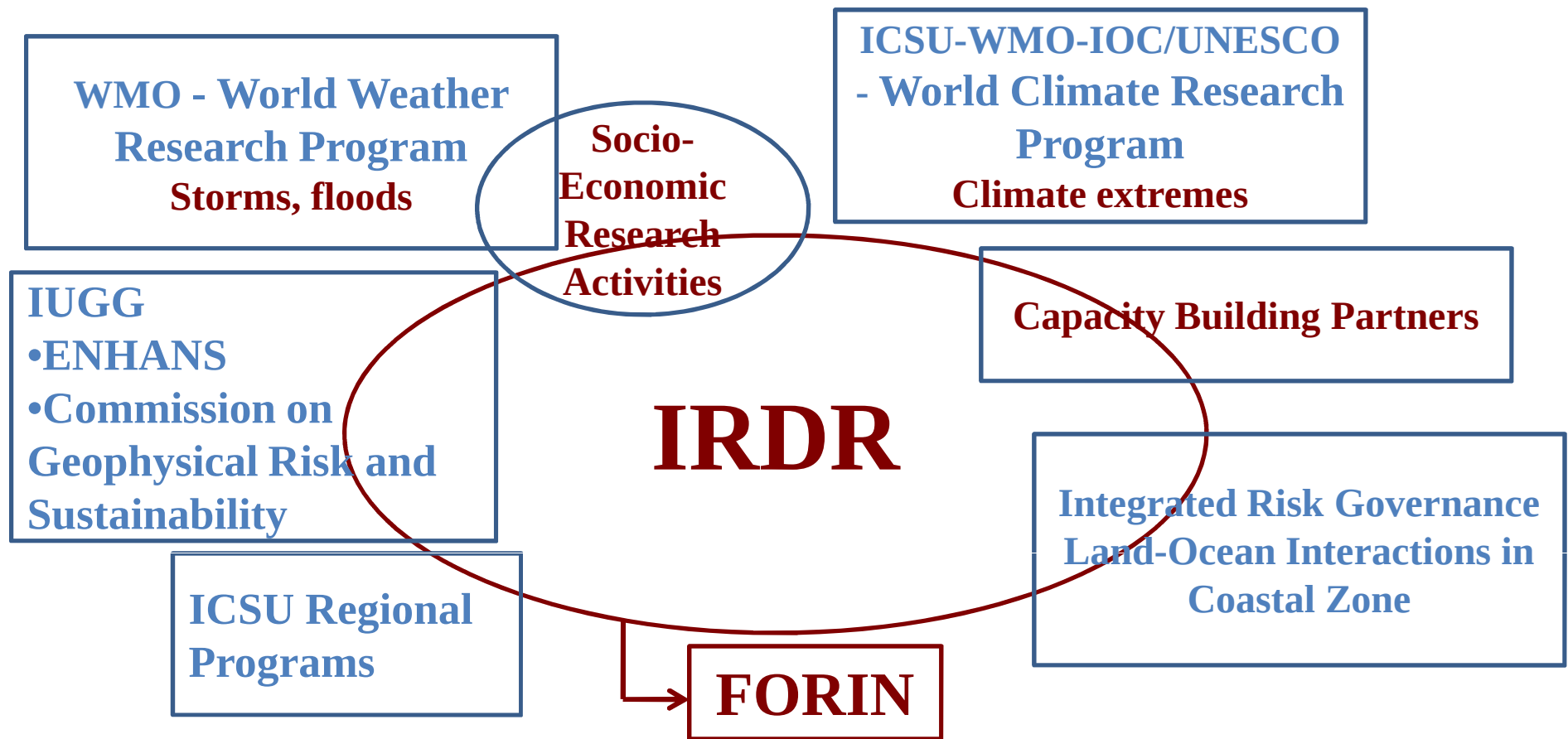
**ICSU Regional Office – Asia
and Pacific – Kuala Lumpur**

Global Change System for Analysis, Research and Training: START

The objective of START's **research-driven capacity building** activities is to engage the scientific communities of developing regions in collaborative scientific research on GEC, applications and action/policy.



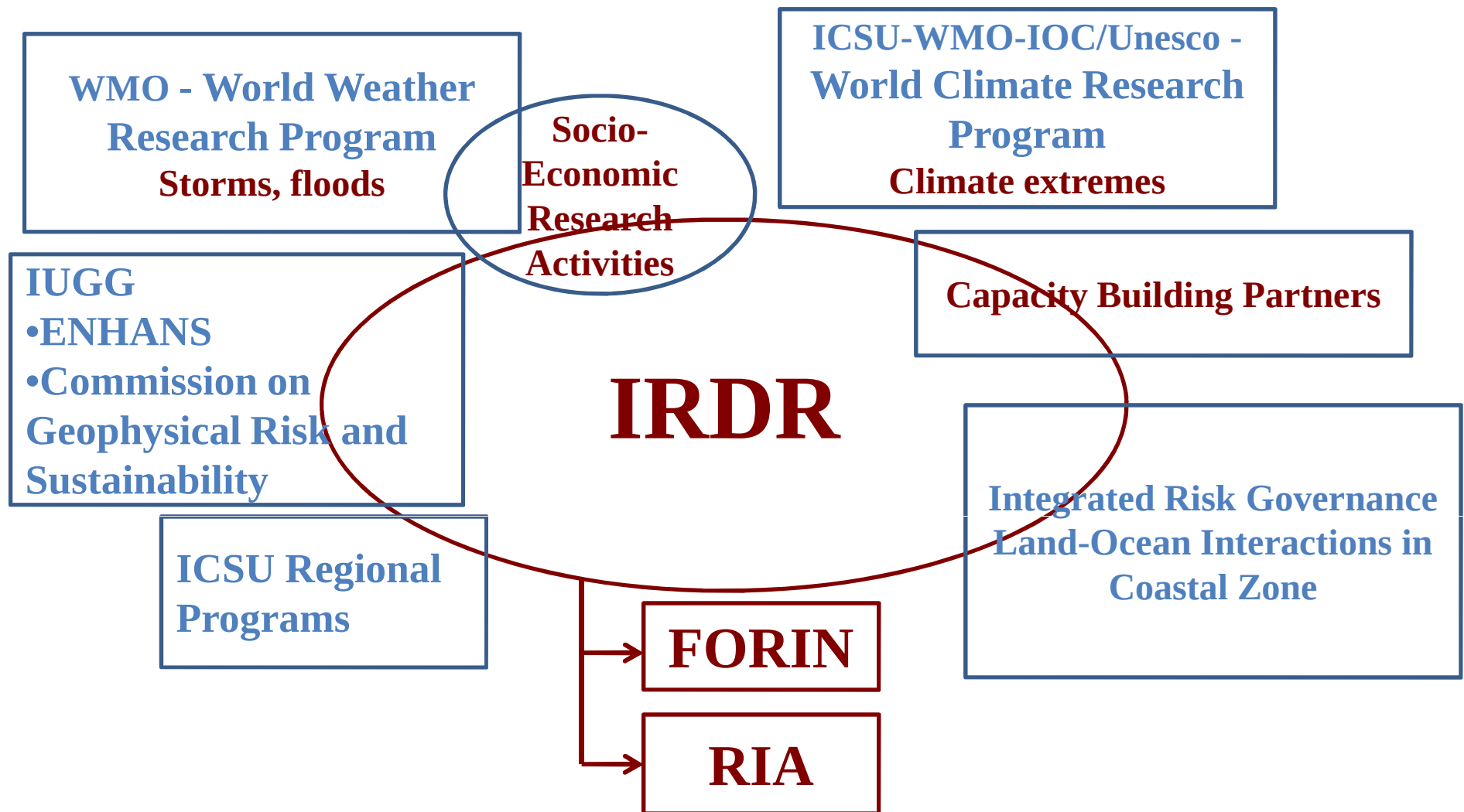




Forensic Disaster Investigations (FORIN)

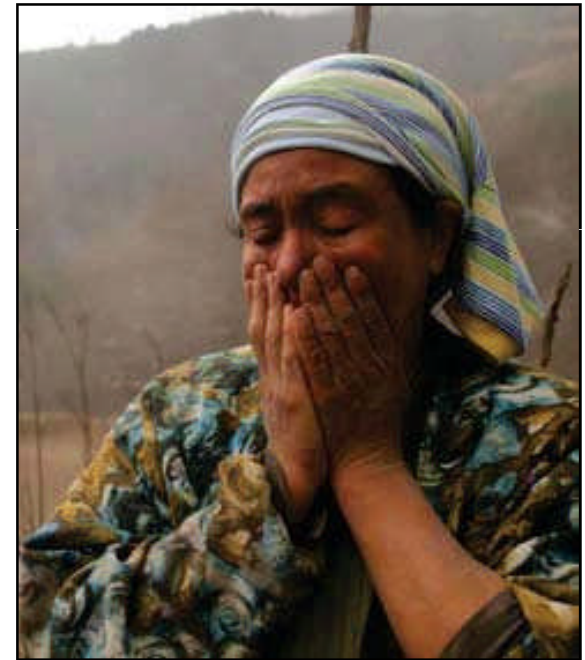
- **Probe further into complex and underlying causes of growing disaster loss**
- **Fundamental cause of disasters**
- **Trace out and assign causal explanation of losses**
- **Intervening conditions that increased or reduce losses**
- **Series of case studies**
- **Common template and methodology**





Risk Interpretation and Action (RIA)

- **How actors attempt to make sense of experience and information from various sources as a basis for decision.**
- **Estimation of the likelihood, magnitude of event & vulnerability of physical infrastructure**
- **Social and behavioural factors leading to greater or lesser risk**



2003-2008

**Bangladesh – Bola
1970 – 300,000 deaths**

Fatalities

Year	Country	Disaster	Fatalities
1983	Ethiopia	Ethiopian drought	300,000
1976	China	Tangshan earthquake	242,000
2004	South Indian Ocean	Indian Ocean tsunami	226,408
1983	Sudan	Sudan drought	150,000
1991	Bangladesh	Cyclone Gorky	138,866
2008	Myanmar	Cyclone Nargis	133,655
1981	Mozambique	Southern Mozambique drought	100,000

**Bangladesh – Gorky
1991 – 139,000 deaths**

1988	Soviet Union	Soviet earthquakes	87,476
1976	Guatemala		73,338
1985	Colombia		56,809
2001	India		40,000
1999	Turkey		30,000
1998	Honduras		26,796
1977	India		25,000
1985	Bangladesh	Bangladesh cyclone	10,000
1975	China	Haicheng earthquake	10,000

**Bangladesh – Sidr
2007 – 3,000 deaths**

Table 1.1: Disasters with more than 10,000 fatalities, January 1975 – June 2008⁴
(Highlighting denotes disasters within the five-year period, 2003–2008.) EMDAT; Analysis by ISDR, 2008

Bangladesh Cyclone Preparedness Programme



RIA
How were risk actions
changed??

FORIN
What contributed to
reductions??

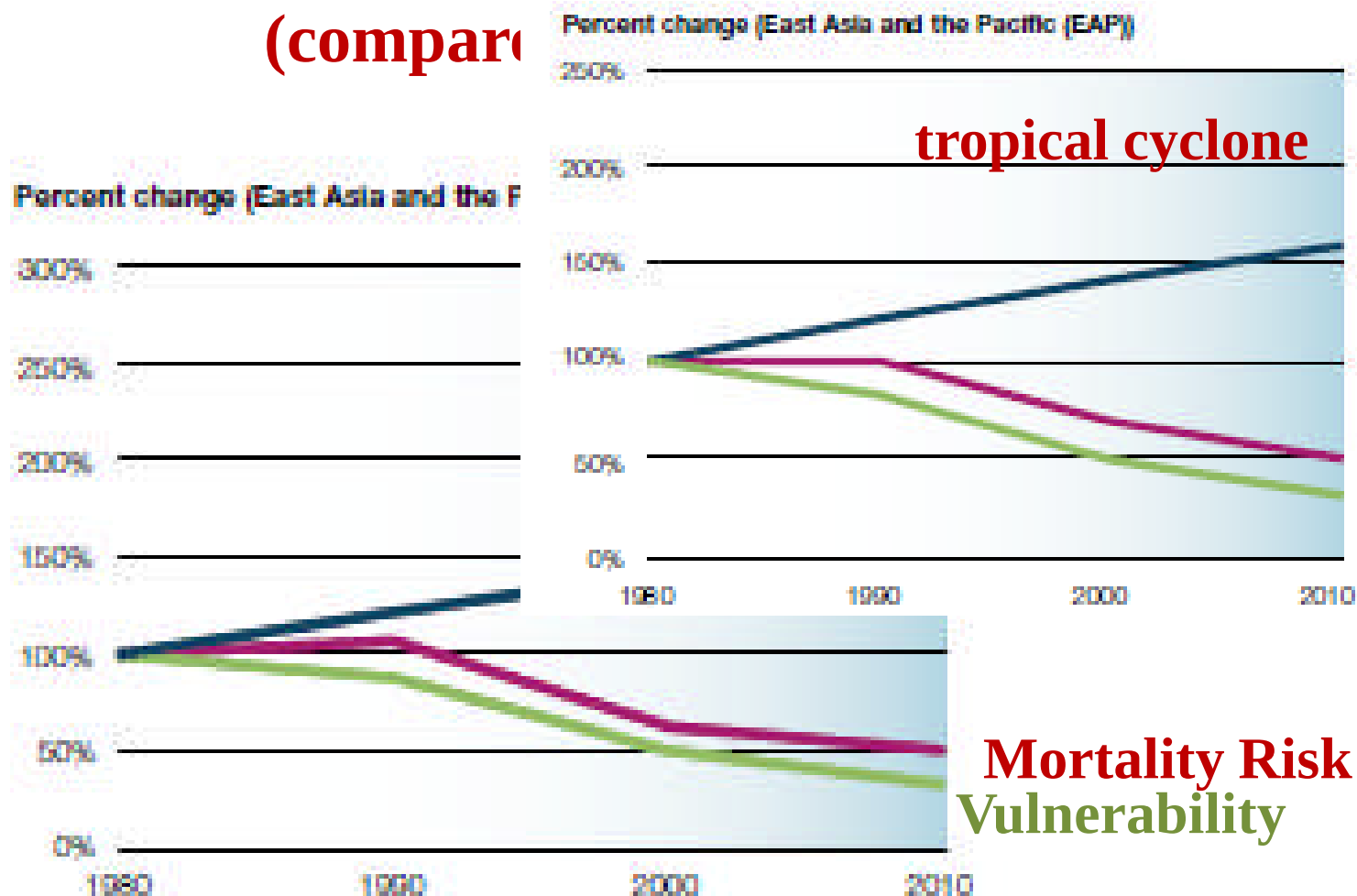
2011 Global Assessment Report on Disaster Risk Reduction: Revealing Risk, Redefining Development

2.2.1 Weather-related mortality risk remains highly concentrated in countries with low GDP and weak governance

2.2.5 Countries that are falling behind in their development achievements have less resilience to disaster loss

Percentage change in flood mortality risk, exposure and vulnerability as modelled from 1980–2010

(compare



East Asia and the Pacific

2011 Global Assessment Report on Disaster Risk Reduction:

Revealing Risk, Reducing Disaster

How can research contribute to the 2013 GAR?

FORIN
Mortality risk reduced; Economic risk increased ??

2.2.2 **Exposure** to floods and tropical cyclones is **increasing**

RIA
How can risk actions be changed??

low-income countries

and mortality risk is decreasing

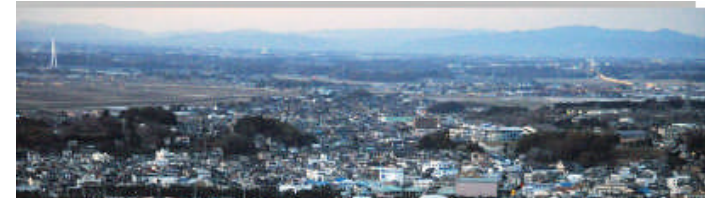
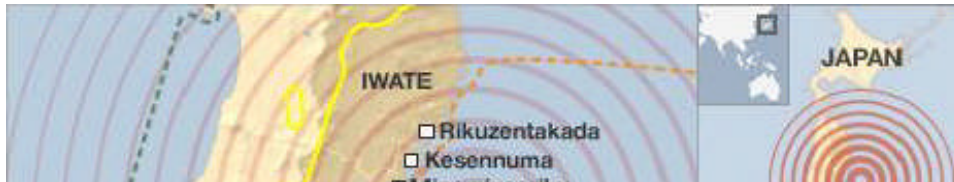
in East Asia and the Pacific, where exposure, flood mortality risk has more

than halved since 1990.

2.2.4 Tropical cyclone and flood **economic loss risk is increasing**

Mega Disaster in a Resilient Society

The Great East Japan (Tohoku Kanto) Earthquake and Tsunami of 11th March 2011

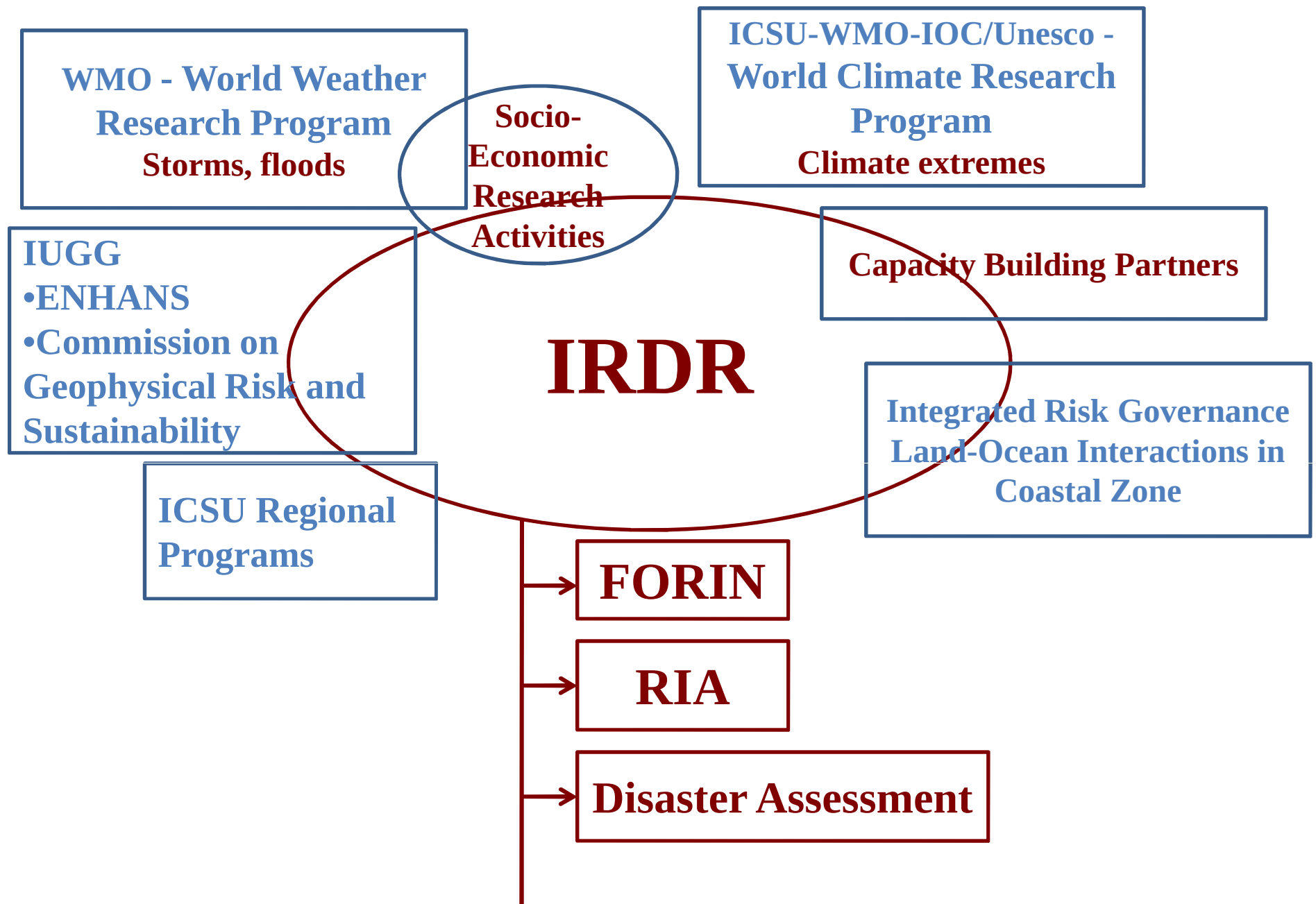


Earthquake → Tsunami → Nuclear Power Stations

RIA
The role of risk interpretation-responses??

FORIN
Complex disaster – technological interface??

March 2011



Assessment of Integrated Research on Disaster Risk (AIRDR)

Purpose: to undertake the first systematic and **critical global assessment of published research on disaster risk under the auspices of the IRDR—new knowledge**

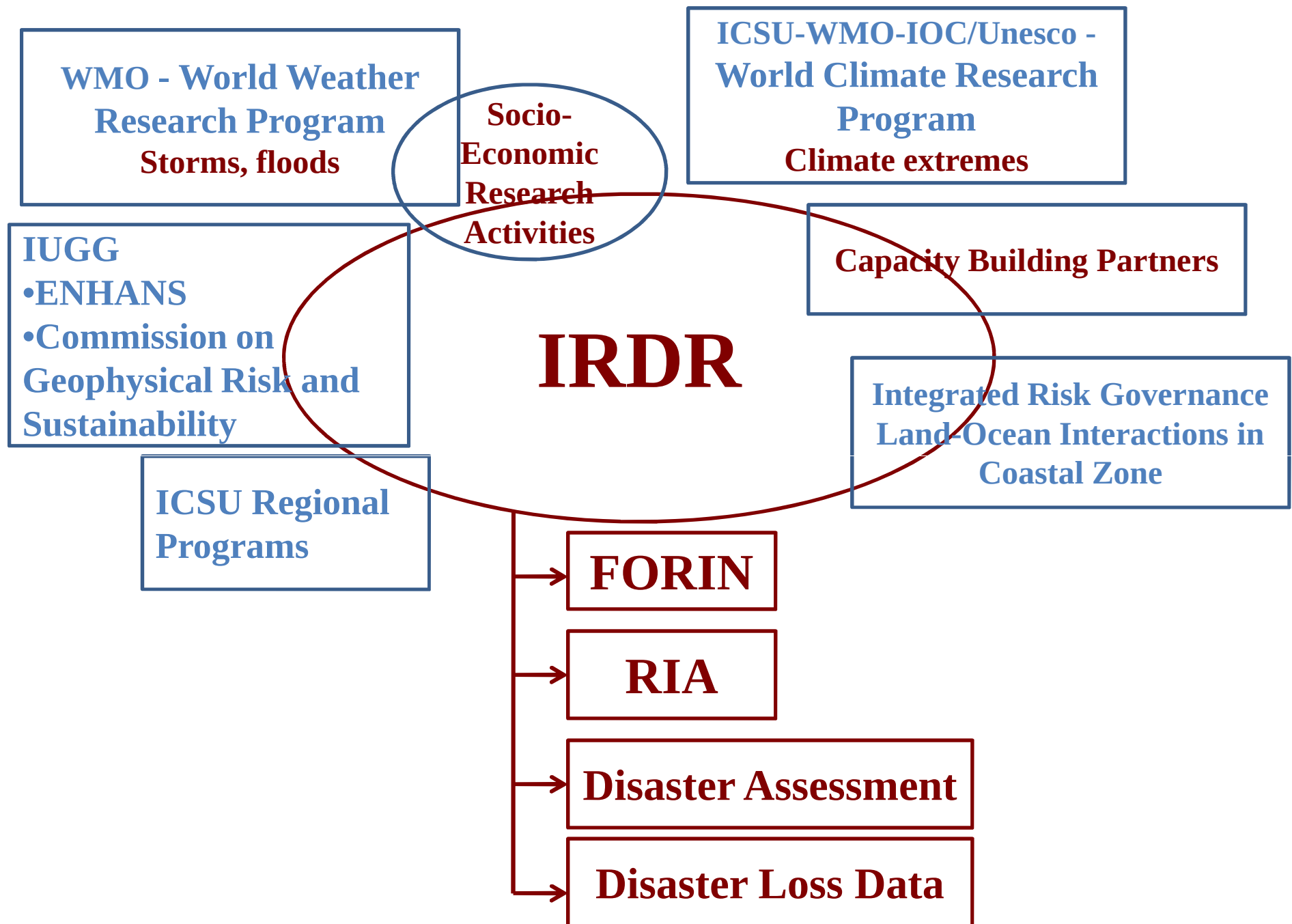
Approach:

- 1. Documentation and critical assessment of extant literature on disaster risk**
- 2. Identification of what is known well and empirically supported, what is less well known, and what gaps exist in our research knowledge base, and what opportunities exist for new research in the co-production of knowledge**
- 3. integrated research assessment report similar to the “Disasters by Design” concept and similar in style to the IPCC.**

AIRDR Goals

- **Provide a baseline of the current state-of-the-science in integrated research on disaster risk to measure effectiveness of multiple research programs**
- **Use to identify and support longer-term science agenda for the research community and funding entities**
- **Provide scientific evidentiary basis in support of policy and practice**





Disaster Loss Data WG

- **Can we improve the existing data quality?**
- **Can we make the data landscape more transparent?**
- **Can we strengthen the data platform efforts?**
- **Collaborate with IUGG Commission on Data and Information, CoDATA and World Data Centers.**

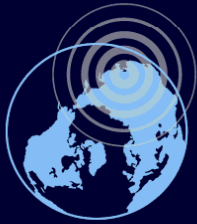


IRDR

Integrated Research on Disaster Risk

Registration and Abstract Submission Open

SAVE
THE DATE



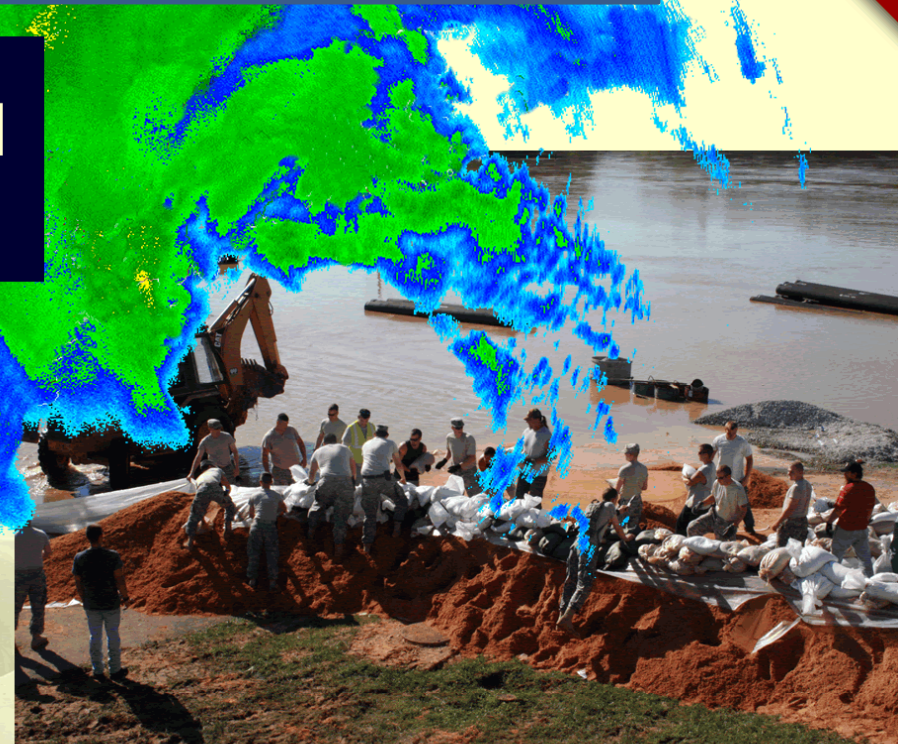
IRDR Conference 2011

Oct. 31 - Nov. 2, Beijing

www.irdrinternational.org/conference2011

*Why, despite advances in the
natural and social science of
hazards and disasters, do losses
continue to increase?*

*To what extent is the world-wide
growth in disaster losses a
symptom and indicator of
unsustainable development?*



Disaster Risk: Integrating Science & Practice

IRDR Legacy

- **An enhanced capacity around the world to address hazards and make informed decisions on actions to reduce their impacts.**
-
- **Societies to shift focus from response-recovery towards prevention-mitigation, building resilience and reducing risks, learning from experience and avoiding past mistakes.**

The Grand Challenges of Integrated Research on Disaster Risk

www.irdrinternational.org

Thank you